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Abstract. This paper reports data from an ultimatum mini-game in which responders first had to choose whether or not to participate. Participation was costly, but the participation cost was smaller than the minimum payoff that a responder could guarantee himself in the ultimatum game. Compared to a standard treatment, we find that the rejection rate of unfavorable offers is significantly reduced when participation is costly. A possible explanation based on cognitive dissonance is offered.

Keywords: Cognitive dissonance; Participation costs; Sunk costs; Ultimatum game

JEL classification: C91; D63

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1 Introduction

In ultimatum bargaining games, a proposer offers a division of a pie (say, 10 euros), which a responder can accept or reject. In the latter case, both parties get zero. In laboratory experiments, small offers (say, 2 euros for the responder) are frequently rejected.[1] In the present paper, we investigate whether and how responders' behavior changes if they have to incur participation costs before they can enter the ultimatum game.

Once the players have entered the ultimatum game, the participation costs are sunk. Hence, these costs should have no influence at all if the players were rational and interested in maximizing their individual monetary payoffs only. Yet, the experimental evidence on standard ultimatum games suggests that responders' behavior might be partly based on inequity aversion and it might also be affected by their perceptions of the proposers' intentions.[2] In order to isolate the effect of the sunk costs on the responders' behavior, we thus endowed them with a show-up fee that was increased by the amount of the participation costs and we made it clear to them that the proposers were not aware of the fact that the responders had to incur participation costs.

Specifically, we modify an otherwise standard ultimatum mini-game (where proposers can choose between three possible offers) such that responders first have to decide whether or not to participate. The participation cost is smaller than the minimum payoff that a responder can guarantee himself in the ultimatum game. Our hypothesis was that in the presence of participation costs, responders would show a higher inclination to accept low offers, because of a desire to avoid having to justify for themselves why they chose to participate in the first place. It turns out that the hypothesis is confirmed by the data.

To the best of our knowledge, this is the first study which investigates responder behavior in an ultimatum game with costly participation. In most previous studies of ultimatum bargaining, players do not face any participation costs. And even if a prior investment stage is considered, the analysis

[1] See Güth et al. (1982) for the original experiment and see Camerer (2003) for a review of the extensive literature.

[2] Note, however, that the evidence might not be as robust as is sometimes suggested. In particular, Stahl and Haruvy (forthcoming) have shown that the vast majority of behavior in ultimatum games is consistent with individualistic preferences and subgame perfection when the verbal presentation of the game is replaced by an abstract game tree. In our experiment, we stick to the traditional verbal presentation.

is typically focused on proposers' behavior. For example, recently Ellingsen and Johannesson (2005) conducted an experiment in which the proposer first could generate potential gains from later trade through a nonrecoverable investment. The authors find that high-(sunk-)cost proposers tend to make more aggressive offers, which could be explained by an increase in the proposers' perceived deservingness. Focusing also on perceived entitlement of proposers but without considering prior monetary investments, Hoffman et al. (1994) conducted an experiment in which a player could earn the position of the proposer (by scoring high in a general knowledge quiz). In this case, the authors find that proposers offer smaller amounts to the responders, which could be explained by an increase in the proposers' perceived deservingness. Ruffle (1998), in turn, designed an experiment in which responders might be perceived as more deserving, because they first have to participate in a contest in order to generate the pie. The focus is again on proposer behavior, though, and it turns out that offers to responders that are perceived as more deserving are more generous. Furthermore, in a related line of research, experiments on the so-called hold-up problem revealed that a party's investment in the creation of a pie tends to be rewarded in a subsequent bargaining stage, see Hackett (1993) and Ellingsen and Johannesson (2004a, 2004b).

Adding to this literature, but shifting the focus to the responders' behavior, our results suggest that a party who has sunk costs might actually be willing to accept smaller offers in a subsequent ultimatum game in order to avoid the feeling that the costs were incurred in vain. A possible explanation for this phenomenon based on cognitive dissonance is proposed in the discussion below.

2 Experimental Design

In the experiment, 10 euros had to be divided between a proposer and a responder. There are two treatments. The first treatment is a standard ultimatum mini-game with available offers "8:2", "5:5", and "2:8" (where the first number denotes the proposer's share). The second treatment is a modification of this game, where the subjects in the role of the responder first had to choose whether or not to enter the ultimatum game at a cost of 1.50 euros.

Subjects were randomly assigned to their roles and instructions were pro-

vided at the beginning of each treatment.[3] All subjects, except responders in the participation-cost treatment, were given an initial endowment (or show-up fee) of 5 euros. The responders in the participation-cost treatment were given an endowment of 6.50 euros in order to ensure that, having paid 1.50 euros for participation, they decide on ultimatum offers at the same level of total earnings as responders in the standard treatment. Moreover, proposers in the participation-cost treatment were not informed about the existence of the participation decision and responders were told that this was the case.[4] The design with knowingly uninformed proposers was chosen in order not to induce an increased feeling of responders' entitlement.

In both treatments, the strategy vector method (Selten, 1967) was used to elicit responder strategies.[5] Note that our standard treatment corresponds to experiment 6 in Stahl and Haruvy (forthcoming).

3 Results and Discussion

Results. The experiment was conducted in the experimental laboratory of the University of Mannheim. In 10 sessions a total of 192 subjects participated in the experiment: 94 subjects in the standard treatment and 98 subjects in the participation-cost treatment. Average earnings were 9.15 euros and 9.39 euros, respectively. The specific results are summarized in Tables 1 and 2 below.

Offer	made by	accepted by	rejected by
8:2	38.3% (18)	63.8% (30)	36.2% (17)
5:5	61.7% (29)	100% (47)	0%
2:8	0%	100% (47)	0%

Table 1. Observed behavior in the standard treatment; 47 observations; absolute frequencies are shown in brackets.[6]

[3]The experiment was computer-based and programmed in z-Tree (Fischbacher, 2007). The instructions and the computer program are available from the authors.

[4]Specifically, proposers simply were told that due to procedures they might not be matched in which case the whole 10 euros would be theirs.

[5]Stahl and Haruvy (forthcoming) also use the strategy method. See also Oxoby and McLeish (2004).

[6]Note that in the standard treatment, we have observed more "8:2" offers (38.3%) and fewer rejections of such offers (36.2%) than Stahl and Haruvy (forthcoming) in their

In the participation-cost treatment, all potential responders chose to pay 1.50 euros for participation. Moreover, the rejection rate for the unfavorable offer "8:2" drops from 36.2% in the standard treatment by more than 60% to a mere 14.3% in the participation-cost treatment; this change is statistically highly significant (p=0.002, one-sided binomial probability test).

Offer	made by	accepted by	rejected by
8:2	36.7% (18)	83.7% (41)	14.3% (8)
5:5	59.2% (29)	98% (48)	2% (1)
2:8	4.1% (2)	100% (49)	0%

Table 2. Observed behavior with costly participation; 49 observations; absolute frequencies are shown in brackets.

Discussion. Note that there should be no difference between the two treatments if the responders considered the show-up fee as well as the participation cost as sunk. Moreover, if neither the show-up fee nor the participation costs were perceived as sunk, so that the responders were only interested in their overall payoffs, then there should also be no difference between the treatments. Apparently, the responders considered the show-up fee to be irrelevant, but not the participation cost. Hence, it seems to be the fact that the responders freely decided to incur the participation cost that makes a difference for their willingness to accept small offers.

Specifically, the sunk-cost effect reflected in the data is consistent with the psychological theory of cognitive dissonance (cf. Festinger, 1957).[7] In essence, cognitive dissonance refers to a kind of mental distress people experience from behavior that is inconsistent but freely chosen. In the experiment, paying 1.50 euro for participation in the game as a responder but rejecting an

experiment 6 (15.4% and 46.2%, respectively). As is pointed out by Stahl and Haruvy, subtle differences in the presentation of the game might play a role; moreover, there may be cultural differences and in our experiment the stakes were somewhat higher because we paid the subjects in euros instead of dollars. See also the closely related (ultimatum mini-)game 3 in Brandts and Solà (2001), who report substantially smaller rejection rates than we have found.

[7]See Harmon-Jones and Mills (1999) for a more recent discussion; see also Akerlof and Dickens (1982) for a discussion of the economic relevance of the phenomenon.

offer of 2 euros can be seen as an instance of such an inconsistency. Participation promises higher payoffs than non-participation; but then rejecting an unfavorable offer would imply that the participation cost was incurred in vain and freely so. Hence, responders are more inclined to ignore the "unfairness" of the proposer. The observation that not all responders choose to accept low offers in the participation-cost treatment could be explained by the fact that despite an intended rejection of low offers, entering the ultimatum game might be perceived by some subjects as a gamble worth paying for.

4 Concluding remarks

In this paper we have made two contributions. First, we have added to the literature on the ultimatum game. We have isolated a novel effect according to which the presence of a participation cost can significantly reduce responders' tendency to reject small offers in ultimatum bargaining. Since an agent typically has to incur some investment costs in order to be needed by a principal for the realization of a surplus, it might be an interesting avenue for future research to explore if our result can be exploited by profit-maximizing principals.[8]

Second, we have identified a simple framework in which a sunk cost effect can be experimentally demonstrated. While conventional wisdom and anecdotes suggest that sunk costs do matter in the real world,[9] it has recently been pointed out by Friedman et al. (2007) that it can be quite difficult to generate a sunk cost effect in the laboratory. Our results suggest that it might well be easier to find a sunk cost effect if the effect does not lead players further away from rational behavior (predicted by traditional models with individualistic preferences), but if instead it counterbalances deviations from traditional models.

[8]Recall that if it were common knowledge that the responder has to incur a participation cost, then the responder might be perceived as more deserving, so a low offer could be regarded as being even more unfair (which might make rejections more attractive again).

[9]See Friedman et al. (2007) for a critical discussion of the existing evidence on the sunk cost fallacy.

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